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Bioarchaeological remains as indicators of costly signalling:

Two case-studies from the Middle Bronze Age of Central Italy

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Theoretical framework, background and aims

This paper concerns the role and relevance of costly signalling in the ritual expressions of Middle Bronze Age human culture of Central Italy. A wide overview of the existing literature and the accurate examination of recent case-studies enabled us to demonstrate that costly signalling is especially identifiable through the study of the ecofactual remains found in caves, which are central ritual sites in the Apennine Protohistory (Grifoni Cremonesi 1999; Whitehouse 2007).

The theoretical framework of costly signalling aims to encompass all those economic, behavioural and social theories which tackle with functionally inexplicable and potentially wasteful human actions, such as taking care of weaker community members, undertaking public generosity acts, building monuments and carrying out religious sacrifices. These non-immediately functional practices have been explored anthropologically by the ‘conspicuous consumption’, ‘wasteful advertisement’ and ‘accumulation of symbolic capital’ theories (Bliege Bird and Smith 2005 and references therein). Signalling, in general, is a way of defining and reinforcing one’s or one group’s identity through different types of communication. ‘Cost’ is the strategy through which the signal becomes trustworthy, as the investment of precious resources and energies by an individual or a community segment constitutes an honest proof of the ingenuity of the message conveyed (Bliege Bird and Smith 2005; Glatz and Plourde 2011). While on a biological level this leads, for example, to successful mating (Caro 1994; Fitz Gibbon and Fanshawe 1988), on a social level it contributes to the acceptance of inequality, as the individuals who decide to give their resources to others replace

the lost wealth with respect and recognition of social superiority (Bourdieu 1977, 1990; Turner 1991). In result of all apparently uneconomic actions identifiable among a human group, a material or immaterial reward in the long term is expected. Costly signalling can thus be considered as a meeting point between materialism and idealism, where symbolic actions come to have very practical purposes. In this paper, we discuss how such theory fits in a religious and social Bronze Age context.

The use of caves as cult places during prehistory has long been the object of complex debates since the 1850s. Palaeolithic caves were not only used as shelters by humans but were also chosen as burial places and to hold the secrets of ancient and often unintelligible symbolisms (Graziosi 1973; Leroi-Gourhan 1964; Ragghianti 1981; Ucko & Rosenfield 1967). It is, however, only in later phases of prehistory that caves started to show more evident structural and material features indicating past ritual performances (Cocchi Genick 1999; Grifoni Cremonesi 1996, 2002; Whitehouse 1992, 2007) (Fig.1). Starting from the Neolithic period we see, for example, the emergence of fertility cults in caves testified by the unveiling of stone circles and pits; special artefactual depositions, among which are overturned or bottomless pots and intentionally fragmented objects; use of ochre and clay (e.g. Grotta Sant'Angelo sulla Montagna dei Fiori (Di Fraia & Grifoni Cremonesi 1996; Grotta dei Piccioni di Bolognano (Cremonesi 1976); depositions or human occupation of isolated areas of the caves close to hypogean and/or thermal waters (e.g. Grotta dell'Orso di Sarteano, Grotta Lattaia, Grotta dei Meri and Pozzi della Piana in Tuscany, Northern Lazio and Umbria (Cuda 2009 and references therein); other structures, e.g. hearths located in non-functional places. Such features are very often sided by human remains that, during the Eneolithic and the Bronze Age, can become so numerous to make these caves proper collective burials, especially in central Italy. On the other hand, caves were also used as pastoral shelters and stables, which does not exclude the ritual and funerary use described above, as first theorised by Bradley (2005) and later demonstrated, for central Italy, by Iaconis and Boschian (2008) through soil micromorphology. In this multi-faceted framework, a class of archaeological remains has often been neglected: the plant and animal remains. These materials, found in most of the caves investigated over the last 150 years, have been only rarely recorded and published in a detailed and systematic way. In addition, they have been rather used to infer palaeoeconomic data about the Early-Middle Bronze Age (between the 2nd half of the 3rd and the first half of the 2nd millennium BC) communities of the Italian peninsula, overlooking the implications of a cultic use. Bioarchaeological cave deposits have in fact constituted the main source for economical reconstructions (e.g. De Grossi Mazzorin 1995), because of the little

knowledge existing on open-air settlements (mainly pile-dwellings (e.g. Carancini 1986; Angle & Guidi 2007; Angle et al. 2011) and hilltop villages (Peroni et al. 1986) for this area and prehistoric phase, which could provide a more reliable picture of economy. This led to creating interpretive biases, caused by the selections operated on the ecofacts with a ritual intent. Significant evidence of costly signalling has been identified, through the analysis of these bioarchaeological remains, whose symbolic aspect was until now unrecognised.

Middle Bronze Age sees the appearance of defended settlements in Central Italy (such as the above-mentioned lakeside and hilltop dwellings). This anticipates a series of significant changes especially taking place in the final part of the MBA and in the Later Bronze Age. In this period (14th to 12th centuries BC) the spread of metal weapons, the emergence of proper necropolises and the stabilisation of settlements indicates an increasing social complexity. In this framework, it is unsurprising that traces of high-cost activities become more evident than in the past. Especially with regard to the mortuary rituals that are often recognised in caves, related to times when the community had to go through a critical loss, it was crucial that the group overcame that loss and remained intact. This could be obtained by carrying out a significant, impactful collective activity to strengthen the bonds among the individuals and give them a way towards their catharsis: for example, the sacrifice of a wealth of resources (such as eatable animals and crops) in exchange for a renovated stability and, possibly, a prosperous future.

Materials and methods

For the purpose of this paper, the Middle Bronze Age layers of Grotta Mora Cavorso and Grotta di Pastena were contextualised and analysed. The MBA deposits of these two sites were fully stratigraphically investigated, with all the structures, artefacts and ecofacts accurately being recorded and studied. These two sites have both returned major evidence of considerable high-cost material sacrifices. While the quality, quantity and distribution of the pottery and fine artefacts did not show such characteristic, some of the structures and most of the ecofacts did. In the first site, the occurrence of costly signalling was indicated especially from zooarchaeological remains, in the second one from palaeobotanical ones. Faunal and plants remains have been taxonomically identified (following mainly Schmid 1972 and Barone 2003 for the fauna and Jacomet 2006 and Neef et al. 2012 for the plants) and then contextualised in their archaeological framework, to improve the reliability of interpretations. In order to rule out any non-anthropic cause of the evidence, a

thorough study of the stratigraphy, post-depositional events and taphonomy on these deposits was carried out (Rolfo et al. 2016; Silvestri et al. in press a, b, c). Landscape and speleothem analyses completed the interpretive process of the two sites, whose typical isolated cave location provided the final proof (with several comparative examples) to interpret them as cult and burial places where costly signalling could be more likely to be recorded.

Grotta Mora Cavorso

Grotta Mora Cavorso (Achino et al. 2016; Rolfo et al. 2016) (Fig.2) is a 715m asl tortuous karst cave in Jenne (Lazio, Italy), discovered in 2006. A decade of excavations of eight selected areas returned numerous archaeological and palaeontological finds, providing interesting information suggesting a long human frequentation of the site ranging from the Late Pleistocene to a few decades ago (Gatta et al. 2016).

A Neolithic layer (L3) is attested everywhere in the cave but usage patterns vary in the different areas of the site, with archaeological remains related to life activities in the external rooms and spaces devoted exclusively to funerary practices in the innermost rooms. In the Upper and Lower rooms, only reachable through an exhausting 60-metre-long series of narrow tunnels, at least 28 human individuals of all ages and both sexes were identified, making this site one of the most important burial deposits of Early Neolithic central Italy.

The Bronze Age deposit (L2) is preserved in both B1 and D soundings (Rolfo et al. 2016) (Fig.3). The first sounding includes a stone-delimited pit containing an overturned bowl, a spindle whorl and a flint bladelet, with two arrowheads lying nearby. A disarticulated female skeleton with a spindle whorl has been retrieved in sounding D. Both the soundings are associated with a large number of faunal remains, among which a strong predominance of perinatal and very young caprines and pigs is attested (Silvestri et al. in press a, b, c).

Costly signalling at Grotta Mora Cavorso

Costly signalling is noticeable in Grotta Cavorso since the Neolithic age: despite the scarcity of the grave goods associated with the burials, the fatigue to transport the dead bodies into the inner chambers is a clear example of high-cost energy expenditure, material sacrifices become instead

evident in a later phase of frequentation of the cave, i.e. the Bronze Age. The faunal assemblage is dominated by sub-juvenile piglets and lambs/kids, including some perinatal individuals. 60% of the ovicaprines and 75% of the pigs were foetuses or newborn (Fig. 4). Most of these infant and neonatal bones were found commingled with the woman's bones, but they were overall slightly more widespread. These faunal remains were represented by all the skeletal portions and no cut nor fire marks were identified. Therefore, although the bone connection was not identified during the excavation, it is likely that the animals were deposited whole and that the possibility of peri/post-mortem processing is highly unlikely. It is interesting to notice that in contrast to this evidence, butchery, skinning and cut marks were identified on wild game (red deer and wild boar) and adult cattle, sheep and goat. Moreover, the adult domesticate and non-domesticate animals appeared to be located on the wider and better illuminated part of the entrance chamber, rather than close to the burial. This suggests that this class of fauna was subjected to different processing practices and intentionally disposed of in a separate location. The foetuses and newborns, instead, were probably killed and deposited to become part of the human burial context. Such a ritual performance, which had to impact dramatically on the economy of the human groups involved (especially for pigs, as lambs/kids were often killed to allow a maximised exploitation of milk), is also found in other cave sites of Central Italy, such as Grotta dei Cocci in Umbria region (Salari et al. 2014), Grotta dello Sventatoio (Angle et al. 1991) and Grotticella 10 di Sorgenti della Nova (De Grossi Mazzorin & Minniti 2002), respectively located in Southern and Northern Lazio. The slaughtering and non-consumption of economically important animals are also found elsewhere in Europe during late Prehistory. In the Late Neolithic-Bronze Age burial site of Minferri (Catalonia, Spain), more than 10 young-adult cattle and one young-adult pig (at their optimum age for being slaughtered and eaten) were deposited whole and in association with human individuals (buried either separately or collectively in *siloi*), indicating an important economic sacrifice by the offering community or the individuals (Nieto Espinet et al. 2014). Other burial sites with this kind of costly-signalling depositions are Can Roqueta (Albizuri 2012), Bobila Madurell (Sant Quirze del Vallès) (Martín et al. 1988, 18), Can Soldevila (Santa Perpètua de Mogoda) (Costa et al. 1982 ; Miró, Molist 1982 ; Gutiérrez 2008, 88, 91), Pla del Serrador (Les Franqueses del Vallès) (Albizuri 2011, 77), Pinetons (Ripollet) (Balsera, Matas, Roig 2011, 261-262), Mas d'en Boixos (Pacs de Penedès) (Farré et al. 2002, 122-123; Senabre et al. 2004, 93), Pou Nou (Sant Pere Molanta, Olèrdola) (Nadal 1993). France shows similar cases of whole bovids, swine and red deer deposited in funerary sites, such as at Colmar 'Aérodrome' (Auxiette & Méniel 2013), where three young pigs were found with an almost complete skeletal representation and no

butchery or cooking marks, associated with single or multiple human burials, present both as recognisable skeletons and as chaotically commingled bones. In all these cases, given the particular deposition structures and the large amount of individuals, the hypothesis of the disposal of naturally dead individuals for hygienic purposes does not seem reliable. It seems, therefore, that animal sacrifices in burial contexts were a widespread phenomenon in the 3rd and 2nd millennium BCE in the Mediterranean area.

Grotta di Pastena

Grotta di Pastena (Lazio, Italy) (Fig.5a) is a vast karst complex at 196m asl located in the homonymous town. The Rio Mastro, a seasonal water stream, runs through the site feeding a water basin that was hidden by a cave wall until recent times. Archaeological remains (including human bones, burnt seeds and pottery) have been found on both sides of the cave since the 1940s (Segre 1946, Guareschi and Morandini 1943), with a MBA bronze axe and a dagger recovered in the water basin (Biddittu 1987), transported by the creek. A 20m² ca. wide chamber called Grotticella W2 (Fig.5b), on the left side of the river, is under investigation since 2012 (Angle et al. 2014). The floor level yielded an incredibly well preserved 35cm-deep BA primary deposit, protected under one metre of sterile fluvial alluvium and historic times' finds. The stratigraphy is characterised by thin layers of charcoal and burnt plant remains alternating to unusually small-sized stone pavements, repeated four times. Numerous hearths were identified, along with a pit and a standing stone structure (Fig.6a-b-d). A large quantity of ceramic sherds and artefacts were found in the burnt layers and between the paving stones, together with polished and carved bones and stones. Burnt seeds are worth a particular mention. Several hundreds of thousands have been found, belonging mainly to broad beans and cereals. The faunal remains are relatively rare but they provide enough information to formulate some interpretations, as the remains of sheep, goat, pig and cattle (with wild game being virtually absent from the deposit) consist of mostly meat-rich bones (such as ribs, vertebrae and long bones) and are characterized by cut and fire traces, indicating cooking and consumption actions. Given that the ritual of the seeds' deposition and paving construction has been repeated multiple times, and that the faunal remains were found in all the layers, the zooarchaeological and contextual analyses undertaken at this cave would suggest that one or more meals were carried out, possibly during the ceremonies performed at the site and most likely with a ritual connotation, as it was common on these occasions.

It is worth to note that a similar stratigraphic situation, but on a reduced scale, was also found on two small terraces of W2 (Fig.5c-d), 2m above the floor level. In particular, the discovery of a bowl upside down on a river pebble, of human bones and a bronze pin, in these hardly accessible spaces, could be extremely significant, especially in the context of this work, which is aimed at emphasising the evidence of high-cost actions.

Costly signalling at Grotta di Pastena

Carbonised crops (Fig.6c) are certainly the predominant remains found in this cave. They formed proper layers alternating with the stone pavings, and are roughly estimated to amount to several hundreds of thousands. Palaeobotanical analyses carried out on a sample of five thousand grains ca. (Table x) showed that the species proportion appears quite constant in the various layers, with broad beans (*Vicia faba*) amounting to 90% of the total. Cereals compose almost the entire 10% left, with a prevalence of glume wheat (*Triticum monococcum/dicoccum*), free-threshing wheat (*Triticum aestivum/durum*) and barley (*Hordeum vulgare*). Two grape seeds (*Vitis vinifera*) were also retrieved on the terrace, alongside other peculiar remains listed above. The remarkable quantity of seeds, their carbonised state and their spatial distribution, indicate that the palaeobotanical dataset of the Grotticella W2 was not formed out of accidental over-cooking. It would rather seem that those seeds were intentionally burnt and spread on the different layers of the floor and on the terrace, close to the several combustion areas, for a specific purpose and in a repeated manner (for at least three or even four times).

The offering of the many broad beans mixed with cereals seems to be a recurring ritual marker in many burial caves in Central Italy, including Grotta Vittorio Vecchi and Grotta dello Sventatoio (Costantini and Costantini Biasini 2007) in Lazio and Grotta Misa in Tuscany (Tongiorgi 1947). The link between beans and the cycle of death and rebirth is acknowledged for several literate civilisations of the Mediterranean (Egyptians, Greeks, Romans) and Northern Europe (de Cleene and Lejeune 2004 and references therein). These legumes were believed to contain the souls of the dead and were often deposited close to human burials or kept in the houses as charms, such as during the Roman festivals of Lemuralia, when the *Pater familias* would throw those pulses behind him to chase the evil spirits away (Beer 2010:44). They were often considered as taboos for certain categories of people or in certain periods of the year (ibid.): one classic example is the prohibition of consumption for the Pythagoreans. Given their wide presence in Middle Bronze Age caves, the origins of such cults are likely to go back in time to this phase and to hold a strong relation with the

cycle of sowing and harvesting. This would be also the reason for the link with the funerary use of caves in Central Italy.

Discussion

A sacrifice consists of the intentional self-bereavement of a source of well-being for a non-immediate purpose, often characterised by symbolic implications. Because of the material loss implicated in sacrificing personal or collective wealth, religious reasons are often used to justify such apparently self-destructive actions. Ritualised community performances often involve some forms of costly signalling, which is otherwise usually identified mostly in individual or high-status group initiatives, such as *kula* (Malinowski 1920) and *potlatch* (Mauss 1925) in the so-called 'gift economies'. These practices are aimed at affirming or strengthening the power of certain individuals. Although no specific and prompt reciprocation are explicitly expected from the recipients, there is a sure return in these acts, at least in terms of loyalty received by the donors. In the case of religious sacrifices, this reciprocity is much less sure and the cost is therefore much higher.

Even in the case of high-cost offerings, and especially on the occasion of funerary rituals, wealth signalling might be carried out by selected members of a community, although this does not have to be always the case and it is very difficult to establish the difference in the case of MBA caves.

The reason of such issue is the scarcity of systematic data from settlements, which prevents from elaborating a reliable and well-substantiated picture of the social structure during this period in Central Italy. Costly signalling should be better identified and understood when an accurate comparison between living sites and cult/burial places is possible. It is likely that the latter show exaggerated wealth markers compared to the real socio-economic situation of the human groups examined, as religion tends to catalyse the spiritual and material energies on disposal of a community.

In this context, the discoveries at Grotta Mora Cavorso and Grotta di Pastena can be explained. Large amounts of food sources, intentionally deposited with no sign of consumption (no cut or fire marks on the bones in the first; inedible, carbonised seeds in the other) are extremely visible depositions. Even assuming that only a part of the community could access the caves and assist directly in the offering actions, the absence of several, potentially high-feeding pigs and of quintals of legumes and cereals (either produced for the farmed animals or for men themselves) would certainly be noticed in the everyday life.

Given that the identification of this kind of large ecofactual offerings is mostly associated with burial remains (e.g. Grotta dello Sventatoio, Grotta Vittorio Vecchi, Grotta Misa, Grotte di Belverde, Grotta dei Cocci, other than the two cases studies examined here), it could be hypothesized that they were carried out because of the death events.

Therefore, it is necessary to contextualise the funerary evidence of the first half of 2nd millennium BC Central Italy, in order to draw wider conclusions involving the origins of ecofactual costly signalling. First of all, it is important to stress that the number of burials identified between the Neolithic and the late Iron Age is in constant increase, except for the phase analysed in this work. The Eneolithic collective cave tombs are a striking example, and so are the incineration necropolises of the Late Bronze Age (Guidi et al. 1993). This could lead to hypothesise a population decrease during the Bronze Age, but there is no other evidence to support such an occurrence¹. Although the currently known settlements are only a few, as mentioned above, the count of them is exponentially increasing with the improvement of systematic surveys and technologies, and their dimensions and productive potential are convincing enough to exclude the possibility of a demographic collapse in the 2nd millennium BC. Therefore, the overall low amount of burials known for this period, almost exclusively found in caves that mostly held less than ten or even five individuals, seems to indicate some kind of selection occurring in the funerary ritual. More specifically, it is possible that, given the high cost of the depositions associated with the burials, only the wealthiest and most powerful emergent lineages of the communities were admitted to a cave burial. Society must have been organised according to a hierarchy (not necessarily of long-term duration), as female and juvenile individuals are always present within the human groups found in these caves. This means that lineages might have been already existing, with wives and children of big men being honoured even after the death of the head of their family. However, the impossibility of correlating the offerings with a specific deceased (if this was the case), given the chaotic dispersal of materials, prevents us from understanding whether there was also an internal difference in importance between the various humans buried in the caves.

In this context, two are the possible paths to interpret the ecofactual offerings: the first one concerns a proper example of classic costly signalling, in which the members of the lineage or family of the deceased sacrifice a remarkable part of their patrimony to show the rest of the community

¹ An ongoing pilot study on the human demography of Central Italy between the Early and the Late Bronze Age (presented at the 2012 Liverpool's TAG) seems to show that the quantity and width of settlements is constantly increasing, rather than decreasing.

their still alive power and wealth. The other possibility is that a larger part or the whole community collected their resources to offer to the dead and, contemporarily, to the Gods, in a sort of exchange pact based on the cycle of death and rebirth for the propitiation of fertility. This second option would correspond to a more typical religious sacrifice, with costly signalling coming from a larger or entire human group wanting to affirm their capacities not to other people, but to supernatural entities.

In all the cases mentioned above, a high-cost self-deprivation is a tool used by single individuals or a collectivity to signal their status and, even more importantly, to construct and reinforce their social identity as parts of a group. Therefore, sacrifice is always an investment, which leads to the stabilisation of a community even in times of difficulties and crisis, such as on the occasion of a death.

Conclusions

The dozens perinatal domesticates from Grotta Mora Cavorso and the quintals of burnt seeds from Grotta di Pastena, if not considered in their burial and strongly ritual framework - which has been identified with certainty also thanks to these ecofacts - could have only provided a general and highly unreliable palaeoenvironmental and palaeoeconomic subsistence reconstruction. The same remains, analysed in a social perspective, have allowed to recognise a complex set of symbolic practices and to clarify some possible features of the society who performed these rituals. Traditionally, costly signalling and high-status indicators have been mostly associated with items such as exotic goods (e.g. amber ornaments, obsidian tools), fine artefacts (e.g. bronze weapons, utensils or jewels) and grand and complex structures (e.g. megalithic tombs) (Peroni 2004). However, food products can also constitute markers of signalling intentions (Ménier 1997). Social bioarchaeological studies (Russell 2012, Morehart & Morell-Hart 2015) are only recently becoming widespread worldwide, starting to highlight this crucial feature of fauna and plants for an improved interpretation of the human past. However, Italian prehistoric contexts seem to have been never considered in this light, with bioarchaeological remains being mainly used for drawing subsistence inferences, even in the case of clearly ritual sites (De Grossi Mazzorin 1995). This paper has sought to demonstrate how a neglected class of archaeological materials can offer a key source to shed light on the reconstruction of social aspects of the past, which would otherwise be impossible to recognise. In the same time, we tried to stress the importance of a detailed contextual study, without which interpretations can only remain vague and superficial. This approach could be

certainly used also in other regions and other periods, where food sources could provide even more information: for example, if a species uncommon in the environment is found as a cultic deposition, this would make costly signalling even more evident. Therefore, it is crucial that bioarchaeological remains are not studied in isolation. Indeed, this work only constitutes a starting point for future research in Central Italy's prehistory but can and will also expand in other areas of the Mediterranean, such as the well-documented and promising Catalonia. As also upheld by key scholar Patrice Ménéiel (1997:180), future developments will involve the direct comparison of cult/burial and dwelling sites including the analysis of zooarchaeological and palaeobotanical evidence, which will provide a more filtered set of data to be used for interpretation.

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